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~~WE CLAIM:~~

~~New Patent Claims~~

¹ (replace the original Patent Claims 1 to 71 on the original pages 44-58)

- Sub #67
1. Optical-fibre transmission system comprising a cable closure for optical waveguides with splice organizers and excess-length depositories for excess lengths of optical waveguide and comprising at least one optical-fibre cable, cable lead-in units in the form of cable lead-in spigots being arranged into the cable closure perpendicularly with respect to the axis of the closure body of the cable closure, the excess lengths of optical waveguide and the splice organizers being arranged within the closure body removably in the axial direction of the closure body, and at least one end face of the closure body being closed off in a sealing manner by an externally accessible cover, characterized in that the cable lead-in units are designed as lead-in spigots (13) in the form of pipes (45, 46) tightly fitted on, in that the optical-fibre cables (10) in the form of optical waveguide minicables or optical waveguide microcables, respectively comprising a pipe (8, 9, 15) and optical waveguides (12), optical waveguide strips or optical waveguide bundles loosely introduced therein, are arranged in the cable lead-in units (13, 17 - 18, 45, 46, 56, 70) designed in terms of pipe connecting technology for receiving and sealing off the pipes (8, 9, 15) of the optical-fibre cables (10), the sealing connection of the pipe connecting technology being a welded, soldered or adhesively bonded connection between the pipe (8, 9, 15) of the optical-fibre cable (10) and the cable lead-in unit (13).

2. Optical-fibre transmission system comprising a
cable closure for optical waveguides with splice
organizers and excess-length depositories for excess
lengths of optical waveguide and comprising at least one
5 optical-fibre cable, cable lead-in units in the form of
cable lead-in spigots being arranged into the cable
closure perpendicularly with respect to the axis of the
closure body of the cable closure, the excess lengths of
optical waveguide and the splice organizers being
10 arranged within the closure body removably in the axial
direction of the closure body, and at least one end face
of the closure body being closed off in a sealing manner
by an externally accessible cover, characterized in that
the cable lead-in units are designed as lead-in spigots
15 (13) in the form of pipes (45, 46) tightly fitted on, in
that the optical-fibre cables (10) in the form of optical
waveguide minicables or optical waveguide microcables,
respectively comprising a pipe (8, 9, 15) and optical
waveguides (12), optical waveguide strips or optical
20 waveguide bundles loosely introduced therein, are
arranged in the cable lead-in units (13, 17 - 18, 45, 46,
56, 70) designed in terms of pipe connecting technology
for receiving and sealing off the pipes (8, 9, 15) of the
optical-fibre cables (10), the sealing connection of the
25 pipe connecting technology being a press connection with
sealing means and a pressing element with a union nut,
between the pipe (8, 9, 15) of the optical-fibre cable
(10) and the cable lead-in unit (13).

3. Optical-fibre transmission system comprising a
30 cable closure for optical waveguides with splice
organizers and excess-length depositories for excess
lengths of optical waveguide and comprising at least one
optical-fibre cable, cable lead-in units in the form of
cable lead-in spigots being arranged into the cable
35 closure perpendicularly with respect to the axis of the
closure body of the cable closure, the excess lengths of

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optical wav guide and th splice organizers being arranged within th closure body removably in the axial direction of the closure body, and

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at least on end face of the closure body being closed off in a sealing manner by an externally accessible cover, characterized in that the cable lead-in units are designed as lead-in spigots (13) in the form of pipes (45, 46) tightly fitted on, in that the optical-fibre cables (10) in the form of optical waveguide minicables or optical waveguide microcables, respectively comprising a pipe (8, 9, 15) and optical waveguides (12), optical waveguide strips or optical waveguide bundles loosely introduced therein, are arranged in the cable lead-in units (13, 17 - 18, 45, 46, 56, 70) designed in terms of pipe connecting technology for receiving and sealing off the pipes (8, 9, 15) of the optical-fibre cables (10), the sealing connection of the pipe connecting technology being a plastic crimped connection (58, 89) or a permanently elastic, annular seal between the pipe (8, 9, 15) of the optical-fibre cable (10) and the cable lead-in unit (13).

4. ⁷²Optical-fibre transmission system according to Claim 1, ^{wherein} characterized in that the closure body (5, 44) has a cylindrical shape.

5. ⁷²Optical-fibre transmission system according to Claim 1, ^{wherein} characterized in that the closure body has an oval shape.

6. ⁷²Optical-fibre transmission system according to one of Claims 1 to 5, ^{claim 1, wherein} characterized in that the lead-in spigots (13) are led in tangentially at the wall of the closure of the closure body (5, 44).

7. ⁷²Optical-fibre transmission system according to one of Claims 1 to 5, ^{claim 1, wherein} characterized in that

the lead-in spigots (13) are led in radially at the wall of the closure of the closure body (5, 44).

8. ⁷²Optical-fibre transmission system according to ~~claim 1, wherein the~~
~~one of the preceding claims, characterized in that the~~
5 cable lead-in units (13) for the inlet direction and outlet direction lie on the same level.

9. ⁷²Optical-fibre transmission system according to ~~claim 1, wherein the cable~~
~~one of claims 1 to 8, characterized in that the cable~~
10 lead-in units (13) for the inlet direction and outlet direction lie at different levels.

10. ⁷²Optical-fibre transmission system according to ~~claim 1, wherein the~~
~~one of the preceding claims, characterized in that the~~
1 cable lead-in units (13) point in the same direction.

11. ⁷²Optical-fibre transmission system according to ~~claim 1, wherein the cable~~
~~one of claims 1 to 9, characterized in that the cable~~
1 lead-in units (13) point in different directions.

12. ⁷²Optical-fibre transmission system according to ~~claim 1, wherein the~~
~~one of the preceding claims, characterized in that the~~
20 excess lengths of optical waveguide (24) are arranged circular up against the inner wall of the closure body (15).

13. ⁷²Optical-fibre transmission system according to ~~claim 1, wherein~~
~~one of the preceding claims, characterized in that~~
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A the excess lengths of optical waveguide (30, 38) are arranged in groups at different levels in the closure body (5).

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Ac 5 14. 72 Optical-fibre transmission system according to claim 1, wherein the one of the preceding claims, characterized in that the excess lengths are protected by a flexible buckle-resistant tube (54), which is deposited in a plurality of loops, maintaining the minimum bending radius, in the inner closure body.

10 15. Optical-fibre transmission system according to Claim 3, wherein characterized in that a plastically deformable soft-metal tube (87) is used for the crimped connection between the microcable and the cable lead-in unit (13).

Sub AT 15 16. Optical-fibre transmission system according to one of the preceding claims, characterized in that a compensation loop (47) of the pipe of the optical-fibre cable (10) is arranged ahead of the lead-in into a cable lead-in unit (13).

20 17. Optical-fibre transmission system according to Claim 16, wherein characterized in that the compensation loop (47) is arranged as an attachment to the cable lead-in unit (13).

Sub A8 25 18. Optical-fibre transmission system according to one of the preceding claims, characterized in that the closure housing (5, 44) and the cover (20, 73, 74) are designed to withstand high mechanical loading for fitting into a drilled core hole of a laying route in the ground, preferably in a road surfacing.

19. ⁷² Optical-fibre transmission system according to ~~claim 1, wherein the~~
~~one of the preceding claims, characterized in that the~~
cable lead-in units (13) for triple branches are fitted
in a T-shape on the closure housing (5, 44).

20. ⁷² Optical-fibre transmission system according to ~~claim 1, wherein the~~
~~one of Claims 1 to 18, characterized in that cable lead-~~
in units (13) for quadruple branches are fitted in a
cross shape on the closure housing (5, 44).

21. ⁷² Optical-fibre transmission system according to ~~claim 1, wherein~~
~~one of the previously specified claims, characterized in~~
that the lead-in openings of the cable lead-in units (13)
are designed in a funnel shape and preferably have a
length stop for the microcable (10).

22. ⁷² Optical-fibre transmission system according to ~~claim 1, wherein the~~
~~one of the preceding claims, characterized in that the~~
cable closure (61) is arranged in a protective housing
(64), the protective housing (64) having lead-through
openings (63) for the optical-fibre cables (62) and ^{an} in
that the intermediate space between the cable closure
(61) and the inner wall of the protective housing (64) is
filled, preferably with a flexible foam filling (66) of
plastic.

23. Optical-fibre transmission system according to
Claim 22, ^{wherein} ~~characterized in that~~ the protective housing
(64) consists of concrete and has a removable, load-
bearing cover (68).

24. ⁷² Optical-fibre transmission system according to ~~claim 1, wherein the~~
~~one of the preceding claims, characterized in that~~

th diameter of the cable closure is 70 to 100 mm and the height is 150 to 250 mm.

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25. Optical-fibre transmission system comprising a cable closure for optical waveguides with splice organizers and excess-length depositories for excess lengths of optical waveguide and comprising at least one optical-fibre cable, cable lead-in units of the cable closure being arranged in the axial direction of the closure body of the cable closure, characterized in that the cable closure (1, 2, 1a, 1b) comprises an extended closure pipe (19), in that the closure pipe (19) is adapted at the ends to the diameter of the pipe of the optical-fibre cable (8, 9, 10, 15), in that the leading in of the pipes of the optical-fibre cables takes place in the axial direction of the closure pipe (19) and in that the seals between the closure pipe (19) and the optical-fibre cables (8, 9, 10, 15) take place in cable lead-in units (17 - 18) adapted in terms of pipe connecting technology to the diameters of the optical-fibre cables, the sealing connection of the cable lead-in unit (17 - 18) in terms of pipe connecting technology comprising peripheral press seals.

26. Optical-fibre transmission system comprising a cable closure for optical waveguides with splice organizers and excess-length depositories for excess lengths of optical waveguide and comprising at least one optical-fibre cable, cable lead-in units of the cable closure being arranged in the axial direction of the closure body of the cable closure, characterized in that the cable closure (1, 2, 1a, 1b) comprises an extended closure pipe (19), in that the closure pipe (19) is adapted at the ends to the diameter of the pipe of the optical-fibre cable (8, 9, 10, 15), in that the leading in of the pipes of the optical-fibre cables takes place in th axial direction of th closure pipe (19) and in that the

seals between the closure pipe (19) and the optical-fibre
cables (8, 9, 10, 15) take place in cable lead-in units
(17 - 18) adapted in terms of pipe connecting technology
to the diameters of the optical-fibre cables, and the
5 ends of the extended closure pipe (19) are provided in
terms of pipe connecting technology with an external
thread, in that the seals are formed by union nuts (17 -
18) and elastic sealing inserts (14).

27. Optical-fibre transmission system comprising a
10 cable closure for optical waveguides with splice
organizers and excess-length depositories for excess
lengths of optical waveguide and comprising at least one
optical-fibre cable, cable lead-in units of the cable
closure being arranged in the axial direction of the
15 closure body of the cable closure, characterized in that
the cable closure (1, 2, 1a) 1b) comprises an extended
closure pipe (19), in that the closure pipe (19) is
adapted at the ends to the diameter of the pipe of the
optical-fibre cable (8, 9, 10, 15), in that the leading
20 in of the pipes of the optical-fibre cables takes place
in the axial direction of the closure pipe (19) and in
that the seals between the closure pipe (19) and the
optical-fibre cables (8, 9, 10, 15) take place in cable
lead-in units (17 - 18) adapted in terms of pipe
25 connecting technology to the diameters of the optical-
fibre cables, and in that the seals at the ends of the
extended closure pipe (19, KM) are formed in terms of
pipe connecting technology by crimped connections (87).

28. Optical-fibre transmission system according to
30 ~~one of claims 25 to 27, characterized in that the ends of~~
claim 25, wherein
the extended closure pipe of the cable closure (2) have
different diameters for adaptation to different diameters
of pipes of various optical-fibre cables (9, 15).

29. ⁷² Optical-fibre transmission system according to ~~claim 1, wherein the cable~~
~~one of claims 25 to 27, characterized in that the cable~~
closure comprises a plurality of rings (33, 35) which can
be placed closely against one another.

30. ⁷² Optical-fibre transmission system according to ~~claim 1, wherein~~
~~one of claims 25 to 37, characterized in that the closure~~
body (33, 35), or the extended closure pipe (19), is
longitudinally divided, preferably in the plane of the
cable lead-in units (13, 36).

31. ^{25, wherein} Optical-fibre transmission system according to
Claim 25, ~~characterized in that~~ cutting rings are
arranged in the cable lead-in units (13).

32. ^{wherein} Optical-fibre transmission system according to
Claim 29, ~~characterized in that~~ sealing systems are
incorporated in the separating planes between the
individual rings (33, 35).

33. ^{wherein the} Optical-fibre transmission system according to
Claim 29, ~~characterized in that~~ cable lead-in units (13)
are arranged in the separating planes between the
individual rings (33, 35) or sections.

34. ⁷² Optical-fibre transmission system according to ~~claim 1, wherein the~~
~~one of the preceding claims, characterized in that the~~
interior space of the cable closure (5) is subdivided by
separating plates (29) into a plurality of sections.

35. ^{claim} ~~Optical-fibre transmission system according to one of Claims 1 to 3, characterized in that the cable closure has two covers (68, 73, 76, 80), arranged one above the other, the inner cover (73) sealing and the outer cover (68, 76, 80) absorbing mechanical loads.~~ ^{wherein}

36. ^{claim} ~~Optical-fibre transmission system according to one of Claims 3 or 27, characterized in that the crimped connection protects the tubular microcable (1) at the cable lead-in of the cable closure against tensile, compressive and torsional stress.~~ ^{wherein}

37. ^{claim} ~~Optical-fibre transmission system according to one of Claims 16 or 17, characterized in that differences in the elongation of the microcable (10) with respect to the surrounding bitumen can be compensated by compensation loops (47).~~ ^{wherein} ^{the}

38. ^{claim 3} ~~Optical-fibre transmission system according to one of Claims 3, 27, 36 or 37, characterized in that the complete cable closure, comprising closure body, cover, splice organizer, protective tube, cable lead-in units, sealing systems, crimped connections and compensation loops, is prefabricated at the factory.~~ ^{wherein}

39. ^{claim 2} ~~Optical-fibre transmission system according to one of Claims 2 or 26, characterized in that cold- or hot-shrink tubes, O-rings, annular lip seals or permanently elastic seals may be used for an elastic sealing.~~ ^{wherein} ^{shrink}

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40. Optical-fibre transmission system according to Claim 27, characterized in that sealing heads (DK1-DK4) of plastically deformable material, preferably of a metal, are crimped onto the pipes of the optical-fibre cables (MK1-MK6) in a sealing manner at peripheral crimping points (KRK), in that the closure pipe (MR1, MR2) likewise consists of deformable material, preferably of a metal, and is crimped on at its end faces onto the sealing heads (DK1-DK4) at the peripheral crimping points (KRMR), in that the closure pipe (MR1, MR2) is dimensioned in length such that adequate excess lengths of optical waveguide (LU1, LU2) can be arranged in waveform extent and optical-fibre splices (LS) can be arranged.

41. Optical-fibre transmission system according to Claim 27 ^{wherein} or 40, ~~characterized in that~~ the optical-fibre splices (LS) are arranged in series one behind the other within the cable closure (KM).

42. Optical-fibre transmission system according to Claim 40, ^{wherein} ~~characterized in that~~ the optical-fibre splices (LS) are arranged next to one another within the cable closure (KM).

43. Optical-fibre transmission system according to ^{claim 40} ~~one of Claims 40 to 42~~, ^{wherein a} ~~characterized in that~~ the bore (BDK) in ^{each} ~~the~~ sealing head (DK1, DK2) is adapted in each case to the diameter of the pipe of the optical-fibre cable (MK1-MK6) and in that a peripheral stop (AS) for the pipe of the corresponding optical-fibre cable ~~(MK1-MK6)~~ is arranged within the bore (BDK).

44. Optical-fibre transmission system according to one of Claims 40 to 42, characterized in that

the sealing head (DK3, DK4) has a plurality of lead-in bores (EB), in that crimpable cable lead-in spigots (KES1-KES4) are inserted in a sealtight manner in the lead-in bores (EB), the seals between the pipes of the optical-fibre cables (MK1-MK6) and the cable lead-in spigots (KE1-KE4) taking place at the peripheral crimping points (KRR).

45. Optical-fibre transmission system according to one of Claims 40 to 44, characterized in that the sealing heads (DK1-DK4) and/or the closure pipe (MR1, MR2) consist of copper or similarly plastically deformable metal or copper-based wrought alloys.

46. Optical-fibre transmission system according to one of Claims 40 to 44, characterized in that the sealing heads (DK1 to DK4) and/or the closure pipe (MR1, MR2) consist of aluminium or cold-workable, non-hardenable aluminium alloys.

47. Optical-fibre transmission system according to one of Claims 40 to 44, characterized in that the sealing heads (DK1 to DK4) and/or the closure pipe (MR1, MR2) consist of plastically deformable, non-hardened, stainless steel.

48. Production of a sealtight splice connection with the aid of a cable closure for an optical-fibre transmission system according to one of Claims 40 to 47, characterized in that the closure pipe (MR1, MR2) is pushed over one end of the pipe of the one optical-fibre cable (MK1), in that this end of the optical-fibre cable (MK1) is fixed in a fixing (FMK1) and in that the one sealing head (DK1) is pushed onto and crimped onto this end of the optical-fibre cable (MK1),

in that at a distance, which corresponds to the closure pipe (MR1), the second sealing head (DK2) is crimped onto the likewise fixed end of the pipe of the second optical-fibre cable (MK2), in that subsequently the required
5 splicing work is carried out, in particular with the aid of a splicer (SPG), excess lengths of optical waveguide (LU1, LU2) being provided on both sides of the splices (SS), in that then the closure pipe (MR1), extending over and beyond the excess lengths of optical waveguide (LU1,
10 LU2) and the splices (SS), is crimped on in a sealtight manner on the two positioned sealing heads (DK1, DK2).

49. *claim 40, wherein the*
~~one of claims 40 to 47, characterized in that the~~
electrically conductive pipes of the microcables (MK1)
15 are through-connected electrically conductively to one another by the closure pipe (MR1) and the crimped-on sealing heads (DK1).

50. Optical-fibre transmission system according to one of Claims 2 or 26, characterized in that the sealing
20 heads have threads at their ends, in that deformable cutting rings are inserted at the sealing points between the sealing head outer facings and the closure pipe and between the sealing head bores and the pipe ends of the microcables, in that union nuts over the cutting rings
25 are screwed onto the threads of the sealing heads.

51. Method of connecting a microcable comprising a pipe with led-in optical waveguides, which is introduced into a laying channel in firm laying ground, to an
30 existing optical-fibre transmission system of a conventional type with cable closures from the optical-fibre transmission system according to one of the preceding claims, characterized in that

the microcable (105) is led into an adapter closure (110), for receiving microcables, through a cable lead-in (107) of a manhole (103) of the existing optical-fibre transmission system (104) which has been made in the same laying ground, in that optical waveguides of a flexible cross-connecting cable (111) are spliced onto the optical waveguides of the microcable (105) within the adapter closure (110) and in that the cross-connecting cable (111) is led into a conventional splicing closure (113) for optical waveguides for connection to the optical cables of the existing optical-fibre transmission system (104), the joining together being performed within the splicing closure (113).

52. Method according to Claim ⁷⁰ 51, characterized in that the microcable (105) led into the manhole (103) is mechanically protected by a protective pipe (109) up to the adapter closure (110).

53. Method according to ^{claim} one of Claims 51 or 52, ^{which includes forming} characterized in that a core hole (108) is made into the laying ground (102) on the outer side of the wall of the manhole (103) in the intended leading-in region, ^{and} in that the lead-in of the microcable (105) is led via the core hole (108) and beyond into the manhole (103) in a seal-tight manner by seals (107).

54. Method according to ⁷⁰ one of Claims 51 to 53, ^{wherein} characterized in that microcables at different laying heights are led into a manhole (103).

55. Method of connecting an optical-fibre transmission system comprising a cable closure and at least one microcable comprising a pipe with led-in optical waveguides, which has been introduced into a main channel in solid laying ground,

according to on of the preceding claims, to an xisting
optical-fibre transmission system of a conventional type,
characterized in that the microcable (117) is led at the
end of the solid laying ground (102) into an adapter
5 closure (120) at the height of the laying channel and is
spliced onto a buried cable (124), in that the buried
cable (124) is laid in the earth (123) at the height of
the leading-in level of the manhole (103) made in the
earth (123), is led into the manhole (103) and is spliced
10 there within a splicing closure (113) onto the existing
optical-fibre network.

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56. Optical-fibre transmission system according to
one of Claims 16, 17 or 37, characterized in that a
protective device for elongation loops of optical-fibre
15 cables, in particular of microcables, for terminating a
core hole in solid laying ground is arranged, in that the
protective device comprises a protective cover (SD) and
a driving-in peg (ES), provided centrally at one end, for
fixing in a central hole at the bottom of the core hole
20 (KB), in that the diameter of the protective cover (SD)
corresponds to the diameter of the core hole (KB) and in
that filling material is arranged above the protective
cover (SD) for sealtight termination and for filling the
remaining core hole (KB).

25 57. Optical-fibre transmission system according to
Claim 56, ^{wherein} ~~characterized in that~~ laying channels ~~(VN1,~~
~~VN2)~~ run into and out of the core hole (KB) tangentially.

58. ^{claim} ~~Optical-fibre transmission system according to~~
~~one of Claims 56 or 57, wherein~~ ^{wherein} ~~characterized in that~~ the protec-
30 tive cover (SD) has on its upwardly facing side a pulling
eyelet (ZQ).

59. ^{claim} Optical-fibre transmission system according to ^{wherein} ~~one of claims 56 to 58, characterized in that the driving-in peg (ES) has in the free space of the core hole (KB) as a diameter limitation (EBS) for the elongation loop (ES),~~ ^{with} a diameter which corresponds to the minimum permissible bending radius of the led-in cable (MK).

60. ^{claim 56, wherein the filling} ~~Optical-fibre transmission system according to one of claims 56 to 59, characterized in that the filling material (FM) consists of bitumen.~~

61. ^{wherein} ~~Optical-fibre transmission system according to Claim 60, characterized in that crushed solid materials, for example chippings, are added to the filling material (FM).~~

62. ^{claim} ~~Optical-fibre transmission system according to one of claims 56 to 61, characterized in that the free space of the core hole (KB) underneath the protective cover (SD) is filled with a filler, which does not hinder the free movement of the microcable (MK).~~

63. ~~Optical-fibre transmission system according to one of Claims 1 to 24, characterized in that the cable closure (KMO) comprises an outer body (AK) which can withstand high mechanical loads and a cable-closure sealing body (KDK) fitted in the outer body (AK), in that the outer body (AK) has a removable outer cover (AD), which lies at the same height as the surface (SO) of the laying ground (VG), in that the cable-closure sealing body (KDK) lying thereunder is closed off by an upwardly removable sealing cover (DD), in that cable connection units (KA1, KA2, KA3) in pipe form~~

are led in from below through the outer body (AK) into the cable-closure sealing body (KDK) and in that the ends of the cables (K, MK) are led into these cable connection units (KA1, KA2, KA3) and sealed off.

5 64. Optical-fibre transmission system according to Claim 63, ^{wherein} ~~characterized in that the ends of the cables in the form of microcables (MK), respectively comprising a pipe and optical waveguides guided therein, are connected in a sealtight manner to the cable connection units (KA) by crimped connections (KV).~~

65. Optical-fibre transmission system according to one of Claim 63, ^{wherein} ~~characterized in that a shrink tube piece (SS) is arranged at the end of a cable connection unit (KA3) for the sealtight leading in of a cable (K).~~

15 66. Optical-fibre transmission system according to ^{claim 63, wherein the} ~~one of Claims 63 to 65, characterized in that the leading-in points of the cable connection units, (KA1, KA2, KA3) are bent off in a horizontal direction at the laying height of the cables (K, MK) introduced in the laying ground (VG).~~

20 67. ^{claim} ~~one of Claims 63 to 65, wherein~~ Optical-fibre transmission system according to ^{claim 63, wherein} ~~characterized in that the cable closure (KMO) has additional cable connection units on the side wall, which are fitted on at the height of laying channels for microcables.~~

25 68. ^{claim 63, wherein} ~~one of Claims 63 to 65, characterized in that~~

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the int rm diat spac b tw en th cabl -closur sealing
body ~~(RK)~~ and the outer body ~~(AK)~~ is filled with a
filler (FS), ~~preferably an expandable plastics foam.~~

A
A

Add A127

Add A147

Add A157

add B17

Add C17

Add 17
I2

add 137

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